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ABSTRACT

In this discussion of various educational technologies that have come and gone during the past 40 years in the teaching of psychology, factors affecting the effectiveness of teaching technologies are discussed and six technological innovations are reviewed. These are: (1) teaching by motion picture films; (2) closed circuit television; (3) teaching machines; (4) programmed textbooks; (5) Keller's Personalized System of Instruction; and (6) computer-assisted instruction. Despite efforts to determine which methods and technologies work best, researchers surmise that no significant differences in effectiveness have been found either because there are no real differences, the effectiveness of the teaching method depends on one or more attributes of the student, and/or the effectiveness of the teaching method depends on the impact of the teacher as a person. Parallels from a passage describing the ideal counselor-client relationship are drawn to illustrate the importance of the teacher-student relationship. Next, six roles of the teacher are identified and five key points concerning educational technology are made: (1) that there is a need to concentrate on the teacher's role as a socializing agent, ego ideal, and person; (2) that technologies eliminate opportunites for interpersonal functions by exaggerating the importance of information transmission; (3) that assessment should be based on student maturation, inspiration, and collegiality; (4) that teachers should not replace teaching with technology; and (5) that teachers need to become more "user friendly" to compensate for the increasing role of technology in the educational process. (LH)

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WHAT HAVE WE LEARNED FROM INSTRUCTIONAL TECHNOLOGY?

by
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WHAT HAVE WE LEARNED FROM INSTRUCTIONAL TECHNOLOGY?

Robert S. Daniel

Some time ago I became curious about the various educational technologies that seemed to come and go in the teaching of psychology. Most of them clearly had something to offer the teacher who was interested in improving instruction. Yet they faded away, sometimes leaving fragments that reminded us of their heyday. Were they as good as their proponents claimed? If so, why were they abandoned? Were they as bad as their critics said they were? Then why did they last so long? From a casual observation, the whole business looked a lot like fadism.

Not all technologies follow that trend, to be sure. After all, the printing of books was a new technology 500 years ago. Perhaps somewhere in history one can find that it had its supporters and its critics. Probably there were those who proclaimed that a book was the work of the devil (some still do, for some books), but the system prevailed and grew up to the point that you and I have more than 125 texts from which to select one that our freshmen students will read. The invention of printing certainly did revolutionize education.

The blackboard and chalk was once a new technology. Counting its antecedent of clay and a sharp stick, it is quite a bit older than printing. Most teachers have found that cuddling a piece of chalk in the hand is a sort of comfort blanket. I recall the story of the distinguished British psychologist, Spearman, who gave a lecture at Harvard about his two-factor theory of intelligence. After a suitable introduction, Spearman began to explain that one factor was called "general intelligence" because it applied to a wide range of human intellectual endeavors. But Spearman was clearly uneasy and awkward in his delivery. Fortunately, a perceptive host realized that there was no chalk at the blackboard, so he slipped out, found a piece and quietly handed it to the speaker. Spearman turned and wrote a very small letter "g" in the middle of the board, returned to the lecture stand, talked for an hour with a smooth, organized delivery, never

using the chalk again. Like the book, chalk and blackboard are a permanent part of our teacher/student communication.

The technologies that I have seen in my own 43 years of teaching psychology appear to show a lifespan up to 20 years, or thereabout. It is not always possible to establish start and finish dates precisely, because each one has antecedents and aftereffects. Let me briefly review the six technological innovations in psychology teaching that I have examined.

When I first began teaching on my own, the year prior to completing my degree, teaching by motion picture films was all the rage. At Penn State University, Carpenter was building a film library, doing research on the use of films, and even making and sponsoring new films. Technical quality of instructional films improved markedly. Most departments bought 16 mm projectors and large screens. Minnesota, for example, converted its intro course exclusively to film presentation--a mix of commercial and locally produced films of senior staff lecturing or researching. Students never saw a live professor. We don't do that anymore, but many of us have learned how to use an occasional film effectively. Both technical quality and educational content continue to improve, and the Penn State Psychological Cinema Register continues its distribution services. No doubt, all such material will soon be found only on videotapes.

Teaching by closed circuit television was a normal development from films, as the TV industry borrowed from the movies. This second innovation in my list developed rapidly and spread widely, because it came with the influx of postwar enrollment inflation and appeared to solve the problem of too few teachers. It required a sizable initial investment, but was believed to be cost saving in the long run. Criticisms on pedagogical grounds abounded, but the demise of teaching by TV was largely economic. Films and tapes were not ageless--eventually the major student response was laughter upon seeing outmoded dress, hair styles, and

the like. The cost of remaking tapes wiped out the anticipated savings. But instructional TV still lives, most clearly in the area of broadcast television.

The next two innovations must be considered together, because they were expressions of the same theory of learning and the research that supported it. I refer, of course, to teaching machines and programmed textbooks. The peak of this movement can be closely tied to Skinner's book "The Technology of Teaching," published in 1968. Probably some of you here today have never seen either a programmed text or a teaching machine--they are only found in museums. but counterparts are now available in computers and educational software, and the technology can be found in other educational applications.

Then came Keller's Personalized System of Instruction, or PSI. The life-span of this one can be established rather closely. The most frequent reference, by far, in the PSI literature is Keller's 1968 paper titled "Goodbye Teacher," but in the first issue of the journal Teaching of Psychology, October 1974, Keller writes under the title "Ten Years of Personalized Instruction," thus putting the birth date at 1964. His latest paper, in the February 1985 issue of ToP, must surely be considered his own abandonment of PSI, if not its death knell. I told Charles Brewer that if I had still been editor, it would have been a great temptation to change the title to "Welcome Back Teacher." It is too early to know what the lingering influence of PSI and its several variants will be, but on the basis of prior events, it is wise to predict that there will be some.

Now comes the computer. Will its history become similar to those that have gone before, or will it be more comparable to the influence of the printed book, as many predict? New hardware, software, and applications are upon us at bewildering speed. A new journal, "Computers in Human Behavior," began publication in 1985, and Richard Deni's new book on microcomputing in the psychology teaching lab appeared in my mail last week. Clearly we are in the ascendency phase of this new development.

EVALUATION

Any teacher who has read evaluation research articles on teaching methods has surely been struck by the high frequency of "no significant differences." In those few cases where significance has been found, the practical value of the difference was not convincing, or the cost benefit ratio in using the better method was prohibitive. This finding applies to the innovations I have just reviewed, as well as to others such as team teaching, student vs. teacher centered, lecture vs. discussion, audio-visuals, games and simulations, humor vs. no humor, and probably others. Although I have a speaking acquaintance with much of this literature, to check I went to the several reviews available. These include McKeachie (1954), Birney and McKeachie (1955), Buxton (1956), McKeachie (1962, 1963), Dubin (1968), McKeachie (1974, 1978), Kulik (1980a, 1980b), Resnick (1981), and Gagne and Dick (1983). In all of this literature, you simply cannot find much that will make you confident in selecting one teaching method or technology in preference to another.

This observation flies in the face of reason. In all of the new effort, expertise, and expense of developing and using new methodology, there is surely reason to expect SOME differences SOMEWHERE. Often the authors of review articles will attempt to interpret these findings as caused by "weak methodology; classroom research is field research, and cannot always be rigorous," or "the criterion [typically the final examination] is invalid, or too narrow, or confined to the text content . . .," or that "there is promise of finding differences in the next decade." (It didn't happen.)

Some of us, early on, attributed the lack of success in verifying differences to the probability that variance in exam performance attributable to student characteristics was so overwhelming, that the small amount of variance assignable to the method couldn't be expected to show. Other hypotheses included the idea that students were so adaptable that no matter how you communicated with them or

got them involved, they adjusted to it. The monograph by Dubin, mentioned above, is especially interested in this respect. He not only quoted reviews previous to his own, but includes many individual studies outside of psychology. His conclusion is that we do not find differences between methods because there aren't any differences. Let me quote: "The evidence is all in upon which we may base our conclusions about the relative utility of given methods of college teaching, when this utility is measured through final examinations THERE ARE NO DIFFERENCES THAT AMOUNT TO ANYTHING" (Dubin, 1968, p. 8) [Empnasis his].

There is another possible explanation now available to us following the emergence of Attribute-Teaching-Interactions, or ATI research. This concept means, of course, that the effectiveness of a teaching method depends upon one or more attributes of students. So in any experiment, perhaps half of the students in the experimental group possess an attribute more receptive to the treatment given the comparison group, and vice versa. Consequently, true difference in means could be reduced or obliterated. Variance within each group would increase, further hiding any possible true differences in method. ATI research is continuing at a good pace, but it has already reached the level of higher order interactions that are difficult to interpret. Furthermore, it would seem to be only a theoretical issue unless we can find ways to pretest enrollees and thereafter schedule them by sections.

ANOTHER POINT OF VIEW

Now it is time to reveal my own personal bias. Nowhere in the literature can I find good, solid research on the importance of the teacher as a person. In my opinion, the importance of the teacher is second only to the importance of student attributes, and both are far above teaching method or technology. Of course, such research would be difficult to do, but then any research in the classroom is difficult. It might not be politic, because critics of higher education would claim that it is self-serving, and that's a problem. But it ought to be done.

I did find a number of authors who apparently agree with my bias, although their positions also are not documented. Here are a few:

"Personal relationships are a major part of the educational process" (Lenthal, 1980).

"Watching the instructional scene for 21 years has changed my mind about many things, but not about the importance of the teacher for directing the course of learning" (Erickson, 1983).

"For effective education, colleges need to preserve student-teacher interactions as a central aspect of higher education and to preserve opportunities for teachers to get satisfaction from teaching" (McKeachie, 1978).

"There are some aspects of . . . instruction that [technologies] cannot simulate, namely those centered around the interpersonal student-teacher interaction" (Gagne & Dick, 1983).

"Most educational situations are interactive . . . [with a learner . . . and a teacher] . . . who has resources for instruction and a capacity to adapt to the learner" (Beard & Bligh, 1972).

"Teaching is a human activity involving a very complex relationship between two human beings--or at least it ought to. If it doesn't the teacher became technologically obsolete with the invention of printing. I use the word humane to cover every aspect of the personal, human relationship. The humane teacher must have a deep affection for students. [He or she] is

understanding, encouraging, sympathetic, and generous. The humane teacher has a constantly expanding range of interests that are displayed without ostentation for the student's consideration" (Kuhlman, 1983).

Now here is a summary of a literature survey that puts it all together, the status of research on different methods AND proper attention to the role of the teacher.

". . . systematic evaluation of a wide variety of different kinds of teaching methods show that almost all of them are effective to some extent, and that no one of them is consistently better than the others." The beneficial effects are due to the common elements running through all the various treatments given by teachers employing different approaches with students seeking to learn. A primary feature that has been singled out is providing the student with personal attention. The general approach we recommend involves the joint work of the teacher and the student in assessing and improving the student's progress. The successful teacher abstains from just telling the student what to think. "Instead, the teacher tries to help students make the fullest possible use of their own resources for arriving at the best possible understanding in terms of their own cognitive style."

Sounds good, wouldn't you say? A pretty fair statement of the state of the art of teaching. In fact, it's so good, I'd like for you to read it again for yourself from this transparency.

* * * * * * * * * *

Notice that the first and last sentences are verbatim; in between is a paraphrase. Even an ex-editor can't resist showing that something can be said just as well in fewer words. Have you seen this summary before? Anyone know where it came from? Don't answer that because I have a confession to make. I engaged

in a bit of hanky-panky. Here is the way the summary actually appeared in an article by Janis in the American Psychologist of February 1983:

> ". . . systematic evaluations of a wide variety of differents kinds of counseling treatments show that almost all of them are effective to some extent, and that no one of them is consistently better than the others." The beneficial effects are due to the common elements running through all the various treatments given by counselors employing different approaches with clients seeking help. A primary feature that has been singled out is providing the client with social support. The general approach we recommend involves the joint work of the counselor and the client in assessing and improving the client's progress. The successful counselor abstains from telling the client what to do. "Instead the counselor tries to help clients make the fullest possible use of their own resources for arriving at the best possible decisions in terms of their own value systems" (Janis, 1983, p. 144).

This is the original form of the summary as you can actually find it in the reference cited. To confess my guilt and ask for mercy from the court, each and every word I changed is shown by underlining.

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Surely you will agree that the parallel is striking. In fact, I have long felt that what teachers attempt and that which counselors are trying to do are remarkably similar. I would go so far as to say that some training in counseling psychology should be a very good background for a successful teacher.

SOME PERSONAL RECOMMENDATIONS

In order to develop this theme of the student's need for personal attention, let me submit for your consideration four ideas. First, I shall borrow some material from Bill McKeachie's book, Teaching Tips. In chapter six, he presents

the six roles of the teacher. I have here reordered them, put them into two categories, and added the "function" notation for each one.

ROLE	DESCRIPTORS	FUNCTION
Group A		
Expert	Knowledge of subject matter	Resource
Authority	Organization, delivery, goals, evaluation	Management
Facilitator	Overcoming obstacles, trouble shooting	Service
Group B		
Socializing		Intellectual
Agent	Preparation for post-course identity	Maturation
Ego Ideal	Motivate, challenge, stimulate, excite	Inspiration
Person	Friendship, confidante, trustworthy, affection	Collegiality

At least on a tentative basis, I would suggest that in training graduate students for teaching roles, we do a reasonable good job for the roles in Group A, but something less than good for the roles in Group B. Perhaps this is where we might concentrate for future improvement of teaching.

For the second point, I go back to one of my original questions: Why have so many of the technologies faded away? To be sure, the answer entails many different reasons. Let me add one more to those you are already familiar with. I believe that some of the technologies, if not all, reduced or eliminated the opportunity for those functions in Group B, and exaggerated the importance of Group A, particularly the information transmission function. It pains me to say this, but I do suspect that some teachers may have elected a teaching technology in order to have more time to devote to research, at least in the Publish-or-Perish (PorP?) institutions. To whatever extent the teacher SUBSTITUTES non-human operations for the all-important TEACHER-STUDENT

interaction, the higher-order, long-lasting results of good teaching are likely to suffer. The proper use of these technologies is supplemental, not substitutive.

For my third point, you will recall that most investigators evaluating teaching methods use the final exam as the criterion. We all know, but tend to ignore, that students quickly forget such material after the course is completed. I really don't think we should be concerned about that. What is important is that the students have had an intellectual experience that has, we believe, been the preparation for further life-style learning by way of giving them a way of considering problems. A typical final exam puts emphasis on the teacher's role as expert, and on the text. The enduring effects of a course--those associated with Group B roles, are the effects we should be attempting to measure in order to assess teaching effectiveness. Certainly that is a difficult thing to do, but probably not impossible.

Now my fourth and last point for your consideration: By no means do I imply that we should fall to the level of entertainment in our classrooms just in order to gain good will and friendly relations. Kuhlman, who was quoted earlier, recommends the use of humor in creative teaching to relieve tension and to help students sharpen their thinking process. He tells this story by way of illustration:

> Two men on an ocean cruise were assigned adjoining deck chairs. On the first day out, the first inquired "Would you join me in a game of bridge?" "No thanks, I tried that once and didn't like it." On the second day, the first inquired "Would you care to join me for a game of shuffleboard?" "No thanks, I tried that once and didn't like it." The next day, he inquired "Would you like to go swimming?" "No thanks, I tried that once and didn't like it." This was repeated every day of the cruise, and each time the answer was the same. On the last day, one last attempt was made. "Would you care to join me in a drink before we disembark?" "No thanks, I tried that and didn't like

it. Besides, I must meet my son before we go ashore." "Your only child, I presume." Kuhlman says he has often thought that he could grade his students on the basis of how quickly they react to that story.

So as you get involved in the latest technology, Computer Assisted Instruction, be very careful that you do not let it REPLACE teaching. Do not try to make it do things it is not capable of doing. Remember that the teacher's armamentarium consists of many tools, even those that have faded from view. When you get into computer assisted instruction, and I suspect that most of you will sooner or later, do remember that YOU YOURSELF MUST BECOME EVEN MORE USER FRIENDLY.

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NOTES

1. This paper was presented at the Second Mid-America Conference for Teachers of Psychology held at the University of Southern Indiana, Evansville, IN, October 18, 1985.
2. Robert S. Daniel is Professor Emeritus of Psychology at the University of Missouri-Columbia.